

IMPLEMENTING ARRANGEMENT

BETWEEN

**THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
DEPARTMENT OF COMMERCE
UNITED STATES OF AMERICA**

AND

**THE COMMONWEALTH OF AUSTRALIA AS REPRESENTED BY THE
BUREAU OF METEOROLOGY**

FOR

COOPERATION ON THE COSMIC-2 SATELLITE PROGRAM

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SECTION 1 PURPOSE

This Implementing Arrangement (hereinafter called "IA") describes scientific and technical activities intended to be undertaken by the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce (DOC) of the United States of America and the Commonwealth of Australia as represented by the Bureau of Meteorology (BOM), pursuant to the *Memorandum of Agreement (MOA) on Technical Cooperation in Meteorology, Oceanography and Hydrology* (hereinafter called "Framework Agreement") signed by NOAA and BOM on 24 March 2006. NOAA and BOM intend to undertake information exchange and collaboration as mutually arranged related to supporting the installation and operation of a satellite ground receiving and commanding station in Australia for the Constellation Observing System for Meteorology, Ionosphere, and Climate Follow-on Mission (COSMIC-2) program. All tasks outlined in this IA are in furtherance of, and otherwise consistent with NOAA's and BOM's missions.

SECTION 2 BACKGROUND

Bureau of Meteorology (BOM)

The Bureau of Meteorology's vision is to provide Australians with environmental intelligence for safety, sustainability, well-being and prosperity. Its mission is to:

- Monitor and report on current environmental conditions;
- Analyze and explain trends in environmental data;
- Provide forecasts, warnings and long-term outlooks on environmental phenomena that affect the safety, prosperity and resilience of Australians; and
- Foster greater public understanding and use of environmental intelligence.

National Oceanic and Atmospheric Administration (NOAA)

NOAA's mission is based on science, service, and stewardship. NOAA is working to understand and predict changes in climate, weather, oceans, and coasts. NOAA shares this knowledge with others, and works to conserve and manage coastal and marine ecosystems and resources. NOAA's vision for the future is one of resilient ecosystems, communities, and economies and works to achieve healthy ecosystems, communities, and economies that are resilient in the face of change.

National Environmental Satellite, Data, and Information Service (NESDIS)

NESDIS's mission is to provide timely access to global environmental data and information services from satellites and other sources in order to promote, protect, and enhance the United States' economy, security, environment, and quality of life. To fulfill its responsibilities, NESDIS acquires and manages the United States operational environmental satellites, operates the NOAA's National Centers for Environmental Information (NCEI), provides data and information services including Earth system monitoring, performs assessments of the environment, and conducts related research.

Constellation Observing System for Meteorology, Ionosphere, and Climate (COSMIC-2)

The Constellation Observing System for Meteorology, Ionosphere, and Climate-2 (COSMIC-2) program (also known as FORMOSAT-7) is being conducted under an agreement between the American Institute in Taiwan (AIT) and the Taipei Economic and Cultural Representative Office in the United States (TECRO), signed May 27, 2010, to develop, launch, and operate a follow-on satellite mission to the Constellation Observing System for Meteorology, Ionosphere, and Climate (COSMIC). NOAA is AIT's designated representative, and the National Space Organization (NSPO) is TECRO's designated representative. The primary objectives of COSMIC-2 are to increase the number of global radio occultation (RO) measurements to more than 8,000 profiles, globally, per day and to transition from the demonstration mission COSMIC to a global, reliable system supporting both atmospheric research and operational weather prediction. This new constellation will continuously and more uniformly collect tropospheric and ionospheric data as inputs to daily near-real-time weather forecasts, climate studies, and space weather research.

The constellation, to be comprised of six satellites at low inclination orbit, and six satellites at high inclination orbit, is intended to enhance observations in the equatorial region over what is currently being collected with COSMIC.

The first COSMIC-2 launch is planned for September 2016, and Initial Operational Capability of COSMIC-2 is expected in 2017. Final Operational Capability is targeted for 2019 after the second launch, which is planned for late 2018.

COSMIC-2 Data Recovery and Distribution

The COSMIC-2 Program utilizes a global network of ground stations to receive the raw mission data from the COSMIC-2 satellites, and retransmits the data via the Internet to data processing centers. The current planning calls for enough ground receiving facilities to meet program data latency requirements. For the ground system, NSPO is responsible for satellite command and control, a ground station with receiving and uplinking capabilities, and one of two data processing centers. NOAA is responsible for planning and arranging for the other required ground stations and via the University Corporation for Atmospheric Research (UCAR) for one of two data processing centers. Each ground station has the capability to receive S-band Stored Mission Data (SMD) downlinked from COSMIC-2 satellites. Data from the mission is intended to be made available on a full and open basis.

The program also has a requirement for a second commanding site to complement the primary site in Taiwan. This IA addresses the installation and operation of the satellite ground receiving and commanding station at the Coastal Plains Ground Station in Darwin, Australia.

University Corporation for Atmospheric Research (UCAR)

UCAR is a consortium of more than 100 member colleges and universities focused on research and training in atmospheric and related Earth system sciences. UCAR members

set directions and priorities for the National Center for Atmospheric Research, which UCAR manages with sponsorship by the U.S. National Science Foundation (NSF).

UCAR is a key partner on the COSMIC-2 Program, having been the US manager for COSMIC-1 development and operations. Under cooperative arrangements between NOAA and NSF, UCAR participates in the COSMIC-2 program on behalf of NOAA. UCAR provides for ground support and primary operational processing for COSMIC-2.

SECTION 3 SCOPE OF ACTIVITIES

BOM and NOAA are referred together as "the Participants" in this IA.

Specific areas of cooperation include, but are not limited to, the following:

- Participation in the COSMIC-2 distributed S-band ground station network.
- Development of the BOM COSMIC-2 S-band ground receive and transmit station at a mutually agreed upon location in Darwin, Australia that should form a critical component of the planned COSMIC-2 system architecture and assist the program in meeting program data latency requirements.
- Development of the COSMIC-2 S-band ground station operations concept.
- Provision of the dissemination of COSMIC-2 data products on a full and open basis.
- Scientific or technical cooperation in the application of the data received from the COSMIC-2 system, as mutually agreed.
- The Participants understand that the Australian Government intends to save and hold NOAA and its subcontractors harmless for any and all costs, liabilities, and/or claims by third parties that arise out of hazardous contamination found at the ground station site not directly attributable to the installation, operation, and/or maintenance of the ground station.

The ground station is located at:
Bureau of Meteorology Satellite Earth Station
Coastal Plains Research Farm
350 Anzac Parade
Middle Point
Northern Territory 0822
Australia

The responsibilities of the Participants are categorized in five areas:

1. Site Preparation (Phase 1)
2. Antenna/Baseband Equipment Development (Phase 2)
3. Antenna Assembly and Checkout (Phase 3)
4. Operations and Maintenance (Phase 4)
5. Data Application

Any additional areas of cooperation under this IA should be mutually agreed to in writing and attached to this IA.

The Participants intend to take reasonable efforts to carry out their responsibilities under this IA but the IA is not intended to be legally binding under domestic or international law.

SECTION 4 BOM RESPONSIBILITIES

BOM intends to use reasonable efforts to carry out the following responsibilities:

1. Site Preparation (Phase 1)

- a. Maintain full ownership and financial responsibility of the site preparation project.
- b. Prepare Darwin site in accordance with *Orbital Systems Elevation-Over-Azimuth Antenna Positioners Pre-Installation Guide Rev A.04 (FS7-ICD-0005)*, dated 12 August 2014 and *Formosat-7 Ground Stations to Satellite Interface Control Document Rev 00*, dated 8 April 2015. Preparation activities include:
 - i. Antenna base/pedestal preparation
 - ii. Radome base preparation
 - iii. Installation of all cable trays, signal cables, and power cables
 - iv. Installation of all necessary communication lines including internet connections
 - v. Assure structural integrity and capability to meet antenna interface requirements
- c. Secure all required building/construction permits.
- d. Acquire and maintain necessary radio frequency spectrum approvals and licenses for ground station transmission and reception. This includes the International Telecommunications Union (ITU) compliance and spectrum filings as well as Australia national spectrum authorizations.
- e. Ensure physical and information technology security.
- f. Provide certification of compliance with applicable national environmental regulations.
- g. Other activities as the Participants mutually determine.

2. Antenna/Baseband Equipment Development (Phase 2)

- a. Determine suitable port of entry into Australia that can accommodate aircraft of size required to transport antenna and associated equipment.
- b. Provide import/tax exempt paperwork to bring the antenna/baseband system into Australia.
- c. Provide in-country truck/rail transport to Darwin from port of entry in Australia.
- d. Other activities as the Participants mutually determine.

3. Antenna Assembly and Checkout (Phase 3)

- a. Retain onsite project management until the installation is completed.
- b. Provide all necessary onsite equipment such as cranes, forklifts, and other needed tools/equipment.
- c. Provide at least three technicians/installers.
- d. Lead the acceptance tests, expected to run two days.
- e. Other activities as the Participants mutually determine.

4. Operations and Maintenance (Phase 4)

- a. Operations should commence after COSMIC-2 launch, currently scheduled for September 2016.
- b. Own/operate antenna/baseband equipment for the life of the COSMIC-2 mission, which is expected beyond 2025.
- c. Dedicate antenna to COSMIC-2 satellite supports with understanding that other satellite programs can be supported strictly on a non-interference basis (COSMIC-2 satellite supports have highest priority).
- d. Provide an industry standard secure method for delivery of uplink/downlink data that insures the integrity/authenticity/provenance of the data.
- e. Provide all downlinked COSMIC-2 data to all Internet Protocol (IP) addresses that NOAA provides BOM.
- f. Provide any contractor support necessary for the repair and maintenance of the ground station. The mean time to repair (MTTR) is based on how long the satellites can go without commanding, which is approximately one week, so any repair and maintenance of the ground station should meet one week MTTR.
- g. Other activities as the Participants mutually determine.

5. Data Application

- a. Scientific or technical cooperation in the application of the data received from the COSMIC-2 system, as mutually agreed by the Participants.

SECTION 5 NOAA RESPONSIBILITIES

NOAA, through UCAR and its contractors, as appropriate, intends to use reasonable efforts to carry out the following responsibilities:

1. Site Preparation (Phase 1)

- a. Provide email and telephone support for site preparation.
- b. Provide onsite support, if requested by BOM.
- c. Provide independent assessment of site preparations to assure compatibility and reduce potential interface concerns.
- d. Acquire required U.S. and international spectrum filings.
- e. Other activities as the Participants mutually determine.

2. Antenna/Baseband Equipment Development (Phase 2)

- a. UCAR intends to issue a contract to RT Logic and is responsible for paying RT Logic to develop antenna/baseband system. The system includes:
 - i. 3.7 meter Orbital System Telemetry, Tracking, and Commanding (TT&C) antenna
 - ii. S-band transmit and receive, right-hand circular polarization (RHCP) only
 - iii. 100 watt high power amplifier (HPA)
 - iv. Radome that should sustain winds up to 150 miles per hour (MPH)
 - v. Two CORTEX Systems and associated equipment (Telemetry)

- vi. Hardening the Operating System to meet Center for Internet Security (CIS) benchmarks or equivalent Australian system.
- vii. Configure IT components to meet International Standards Organization (ISO) 27000 series IT security control standards or the respective Government's equivalent security requirements and policies.
- viii. Two-year warranty on the antenna system
- b. UCAR is responsible for shipping and export preparations and activities.
- c. Other activities as the Participants mutually determine.

3. Antenna Assembly and Checkout (Phase 3)

- a. Provide onsite support for installation, assembly, and checkout.
 - i. UCAR/RT Logic is responsible for proper installation and checkout of all equipment needed for seamless handover of all operations and maintenance of the antenna system and interfaces to BOM.
 - ii. UCAR/RT Logic should provide an onsite engineer to guide antenna/radome assembly, power and other cable installation.
 - iii. NOAA and UCAR intend to provide additional onsite support for installation and checkout.
- b. After successful installation, assembly, and final acceptance test, UCAR intends to transfer title of the antenna baseband system directly to BOM.
- c. Other activities as the Participants mutually determine.

4. Operations and Maintenance (Phase 4)

- a. Coordinate the ground station operations concept with BOM.
- b. Provide general performance specifications for a ground station compatible with COSMIC-2 downlink and system performance requirements.
- c. NOAA and NOAA's partners, such as NSPO, to provide a downlink of COSMIC-2 data at an S-band frequency to the BOM ground station for the duration of the COSMIC-2 program.
- d. Provide BOM access to all U.S.-generated Global Navigation Satellite System (GNSS) radio occultation products
- e. Provide BOM free and unrestricted access to near real-time COSMIC-2 raw data to be processed into BOM unique products.
- f. Recognize BOM as a key contributor to COSMIC-2 program.
- g. Provide technical consultation support to BOM as needed/requested.
- h. Other activities as the Participants mutually determine.

5. Data Application

- a. Scientific or technical cooperation in the application of the data received from the COSMIC-2 system, as mutually agreed by the Participants.

SECTION 6 DATA SHARING AND ACCESS

Data generated by the COSMIC-2 system, both raw data from its global network of ground stations and processed data from the U.S. data processing center at UCAR, should be made freely available to BOM, in accordance with United States Government data policy.

BOM is responsible for its own computing, storage and communications costs to acquire and store COSMIC-2 data and products.

It is understood that the data received by the Australian S-band ground station may not be completely acquired over Australian territory.

SECTION 7 DATA SECURITY AND INTEGRITY

NOAA and BOM intend to coordinate regarding information security measures for protecting the availability and integrity of mission data. The Participants intend to adhere to established guidelines and best practices means consistent with the relevant ISO standards or respective Government's security requirements and policies.

SECTION 8 RELATIONSHIP TO THE FRAMEWORK AGREEMENT

This IA, concluded pursuant to the *Implementing Arrangements* section of the Framework Agreement, incorporates by reference and is subject to the terms and conditions of the Framework Agreement. In the event of a conflict between the provisions of this IA and the Framework Agreement, the terms of the Framework Agreement will govern.

SECTION 9 FINANCIAL ARRANGEMENTS

There should be no transfer of funds under this IA. Each Participant is responsible for funding its own activities, subject to the availability of appropriated or allocated funds. Support deemed necessary for the activities listed in this IA is the responsibility of the respective Participants.

SECTION 10 INTELLECTUAL PROPERTY RIGHTS

Provisions for the protection and distribution of intellectual property created or furnished in the course of this IA are contained in the Framework Agreement and Annex I of the Scientific and Technical Cooperation Agreement between the Government of the United States of America and the Government of the Australia, signed on 28 February 2006.

SECTION 11 EXPORT COMPLIANCE

Each Participant should facilitate the entry to and exit from the territory of its country for the specialists, equipment, and goods of the other Participants required for executing this IA subject to all relevant laws and regulations in force in their respective country.

SECTION 12 POINTS OF CONTACT

Regarding the overall Implementing Arrangement (IA):

For BOM:

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For NOAA:

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International and Interagency Affairs Office
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For NOAA:

Jonathan Fulford
COSMIC-2 Program Manager
c/o Office of Projects, Planning, and Analysis
National Environmental Satellite, Data, and
Information Service (NESDIS)
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Silver Spring, Maryland 20910
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E-mail: jonathan.fulford@noaa.gov

Each Participating Institution intends to notify the other in a timely manner of any changes to the above points of contact.

SECTION 13 MODIFICATIONS

This IA may be modified through mutual written agreement by the Participants.

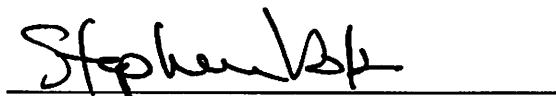
SECTION 14
EFFECTIVE DATE, DURATION, AND DISCONTINUATION

This IA is to be effective upon the last signature appearing below and remain in effect for a period of five (5) years. Either Participant may discontinue this IA at any time by giving ninety (90) days written notice of such intention to the other Participant. The Participants do not intend discontinuation of the Framework Agreement to affect activities being carried out under this IA. This IA can be renewed by mutual agreement through an exchange of letters for additional periods of time up to the end of the COSMIC-2 program.

In the event this IA is discontinued, each Participant is solely responsible for the payment of any expenses it has incurred.

Signed in two originals in the English language.

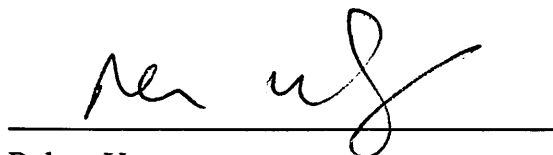
FOR THE NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION



Stephen M. Volz
Assistant Administrator for
Satellite and Information Service

2-10-2016
Date
Washington, D.C.
Place

FOR THE BUREAU OF
METEOROLOGY



Robert Vertessy
Director of Meteorology and
Chief Executive Officer

29 MARCH 2016
Date
CANBERRA
Place